NTSB National Transportation Safety Board

Office of Aviation Safety

Flight Crew Performance:
Operational and Human Factors

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Operational-Human Performance

- Factors ruled out
- Decision to land
  - Mixed braking action reports
  - Performance calculations
- Inability to stop the aircraft
  - Use of reverse thrust

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Factors Ruled Out

- Certificated / qualified / trained
- No accidents or violations
- Medical and behavioral
- Fatigue

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Mixed Braking Action Reports

TERM	BRAKING DECELERATION
GOOD	Normal…
GOOD to FAIR	
FAIR	Noticeably reduced…
FAIR to POOR	
POOR	Significantly reduced…

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Mixed Braking Action Reports

- SWA policy:
  - Defer to the “more critical term”
  - FAIR to POOR → POOR
- SWA policy:
  - POOR: 5kt tailwind component limit
- Crew unaware of mixed report policy

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Mixed Braking Action Reports

- Mixed Reports:
  - Training
  - Limited guidance
- Other pilots also were unaware
- Three previous SWA aircraft landed
- SWA amended training and guidance
- Recommendations

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Onboard Performance Computer

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Onboard Performance Computer

- Output: Stopping margins
- Crew performed several assessments:
  - FAIR produced a margin of 560’
  - POOR produced a margin of 40’
- Crew uncomfortable with 40’
  - Expected better than POOR
  - Expected increased margin with use of reverse thrust

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Onboard Performance Computer

- OPC assumptions:
  - Reverse thrust use assumed
  - Tailwind component limit (5kt)
- Stopping margin based on the actual/presented 8kt tailwind for POOR: -260

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Onboard Performance Computer

- Inconsistent programming
- Training / guidance / presentation
- Calculation assumptions are critical to a pilot's decision to land
- SWA has updated programming
- Recommendations

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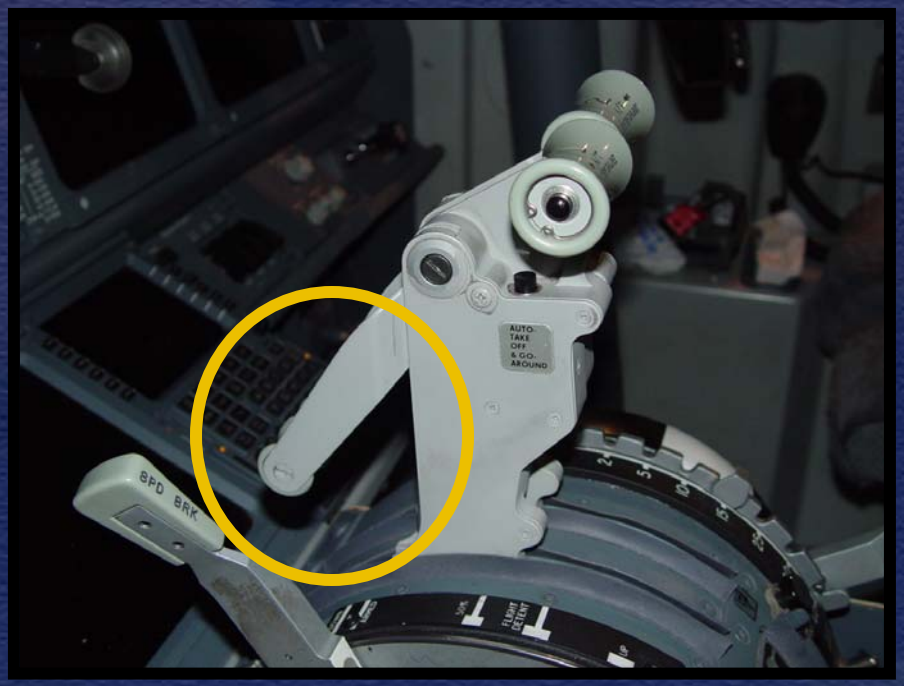
Reverse Thrust



Stowed

Deployed

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Reverse Thrust

- Required reverse thrust immediately
  - All landings
  - Emphasized: Conditions less than GOOD
- Delay in command of reverse thrust
- Would have been able to stop
- Crew and other pilots aware of protocol
- Other pilots landing at MDW

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Reverse Thrust

- New autobrake procedure
- Pilot actions upon touchdown in conditions less than GOOD:
  - Prior: Reverse thrust and manual brakes
  - New: Reverse thrust only
- Learning new procedures
  - Requires practice

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Reverse Thrust

- Automatic Task Sequences
  - Absence → absence
  - Activation → activation
- Accident Sequence:
  - Refrained from manual brakes

    Failed to deploy reverse thrust
  - Manual brakes applied

    Thrust reverse within 3 sec

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Reverse Thrust

- Other pilots demonstrated delay during first use of autobrakes
  - Trials in development of policy
  - Post-accident familiarization period
- Captain stated being distracted
- Crew's first use of autobrakes accounts for their delay
- Recommendations

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